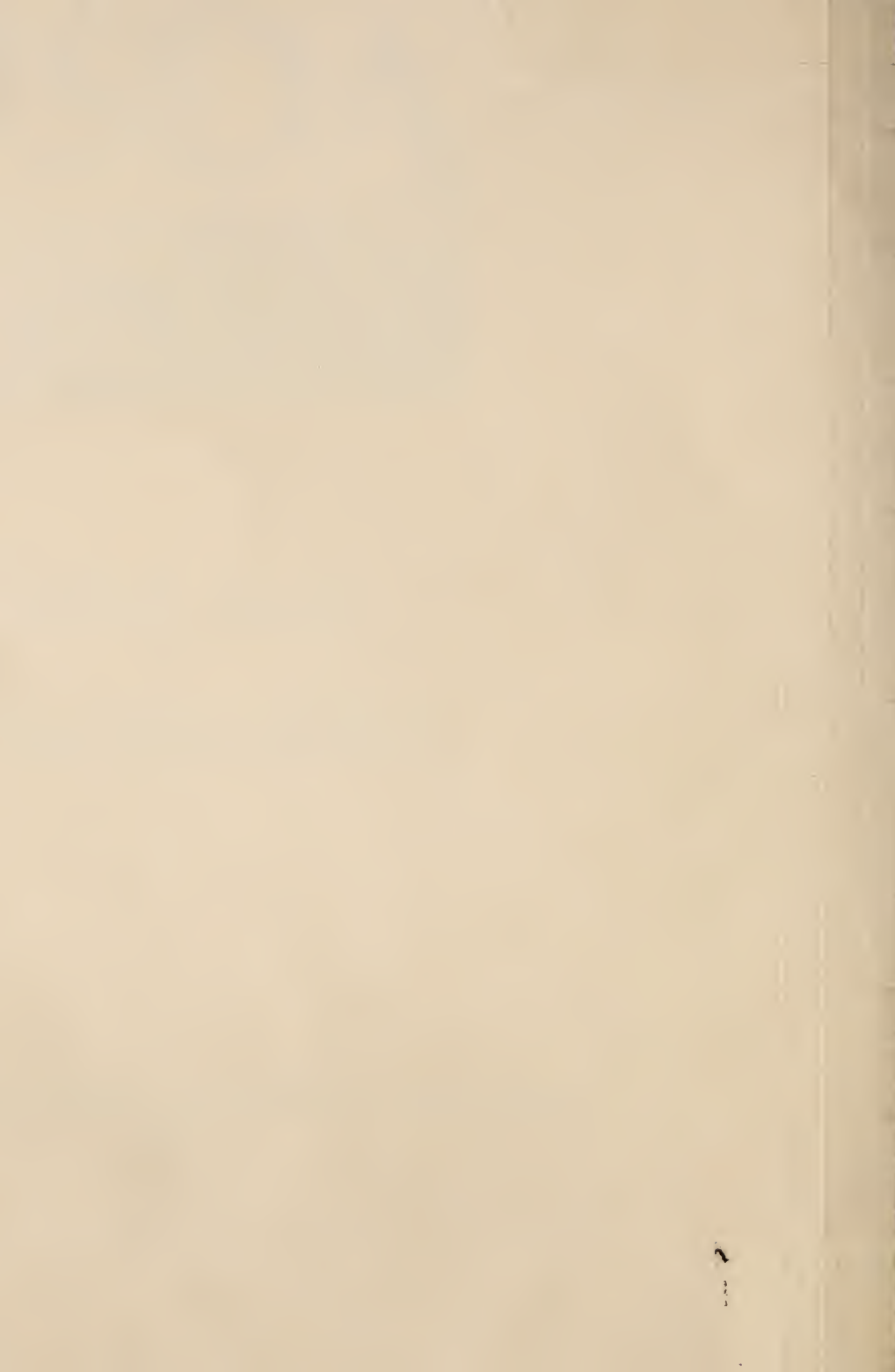


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# **The TIMBER RESOURCES of NEW HAMPSHIRE**



U. S. FOREST SERVICE RESOURCE REPORT NE-1  
1963

NORTHEASTERN FOREST EXPERIMENT STATION, UPPER DARBY, PA.  
FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE  
RALPH W. MARQUIS, DIRECTOR

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## PREFACE

A RESURVEY of the timber resources in New Hampshire was completed in 1960. This report summarizes the timber-resource situation and the changes that have taken place in the 12 years since the first forest survey of New Hampshire.

Field work for the initial survey was done entirely by the staff of the Northeastern Forest Experiment Station; the resurvey was a joint effort with the staff of the White Mountain National Forest. The National Forest personnel assumed responsibility for the resurvey of forest lands under their jurisdiction.

The timber-supply outlook for the state and the demands for timber products have changed considerably. This report describes the current forest-land area and timber volumes and important changes or possible trends. Detailed statistical information and definitions of the terms used are presented in an Appendix.

Users of the data in this report are cautioned to read with care the precise definitions of the terms used, the description of the forest-survey methods, and the statements pertaining to the reliability of the estimates.



# **The TIMBER RESOURCES of NEW HAMPSHIRE**

**by**

**Roland H. Ferguson and Victor S. Jensen**

*Northeastern Forest Experiment Station  
Forest Service, U. S. Dept. Agriculture*



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A fine stand of tall, straight eastern white pine in New Hampshire. This stand is seen from State Route 16, north of Lake Chocorua.

## Introduction

TEN years ago, the first comprehensive report on the timber resources in New Hampshire was published (U.S. Forest Service 1954)<sup>1</sup>. The information in that report was based upon forest-survey sample plots established in 1946-48, and upon other data. Since then many changes have taken place in the timber resource. To assess these changes and to measure the current timber resource, the forests of New Hampshire were resurveyed recently. In this resurvey some of the original forest-survey plots were remeasured and new forest plots were established.

This is a report on the results of our resurvey. In general, the resurvey showed that the area of commercial forest land in New Hampshire has increased, the volume of standing sawtimber has decreased slightly, and the volume of poletimber has increased considerably.

Just as the area and volume of standing timber changed, significant shifts took place in the timber-products industries. Production of timber products from New Hampshire's forests increased during the period 1947-52; but in 1960 production dropped to about one-half of what it was in 1947. In terms of raw material used, lumber continues to be the leading timber product from the forests. The pulp and paper industry in 1960 used about one-half as much wood as the sawmilling industry. Veneer mills used a considerable volume of high-quality hardwood logs. The forests also produced wood for turnery bolts, cooperage logs, fuelwood, excelsior, handle stock, charcoal, piling, posts, poles, Christmas trees, and other miscellaneous specialty products.

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<sup>1</sup> See Literature Cited, page 21.

# **The Wood-Using Industries**

Twelve years ago there were many more primary wood-using plants in New Hampshire than there are today. At that time more than 500 sawmills were operating; but in 1962 only 277 sawmills (including part-time or farm mills) were operating (N. H. Forestry and Recreation Commission 1961). Then there were nine shingle and excelsior mills; now there is only one excelsior mill. Then there were two veneer mills, and in 1962 one of those closed down. However, the three pulp mills that were operating in 1948 are still in business.

## **THE LUMBER INDUSTRY**

Sawmills in New Hampshire produced 175,000,000 board feet of lumber in 1960. This is less than two-thirds of the volume of lumber produced 12 years ago. Most of the lumber production is from the sawmills registered as Class I, or commercial sawmills. The volume of hardwood lumber produced each year has remained about the same for many years, but the amount of softwood lumber produced has decreased sharply since 1943 (fig. 1).

White pine has made up about three-fourths of the softwood lumber production in recent years. According to annual sawmill reports to the Forestry and Recreation Commission, the total production of white pine lumber in New Hampshire in 1951 was 248 million board feet. In 1960 the production of white pine lumber dropped to 124 million board feet, a decrease of almost one-half (Baldwin 1961). At the same time, adjusted prices for white pine lumber changed very little. The decrease in production and the relatively stable price situation are attributable to: (1) greater use of substitute materials, (2) the decline of the box industry, and (3) more intensive competition with other softwood-producing areas.

About 35 years ago, 63 percent of New Hampshire's total lumber production was in round-edge material, most of which was manufactured into boxes and shooks. By 1956 this proportion



## LUMBER PRODUCTION IN NEW HAMPSHIRE

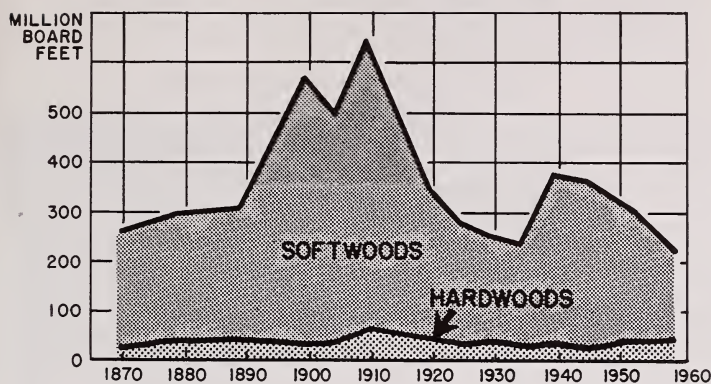


Figure 1. — Production of hardwood lumber has continued at a fairly steady level in New Hampshire, but softwood lumber production has declined sharply in recent years. (Data are from U.S. Dept. Agr. Misc. Pub. 669, 1948.)

had dropped to 43 percent (Wallace and Amidon 1958). According to another survey made in 1959 by Wallace<sup>2</sup> the production of round-edge lumber has dropped to 13 percent. Of the white pine lumber produced, less than 19 percent was round-edged.

Less lumber is being produced by the portable sawmills throughout the State. The shift to larger capacity, permanent-type sawmills with good manufacturing and marketing facilities is a favorable trend for both timberland owners and the lumber industry.

## THE PULP AND PAPER INDUSTRY

Pulpwood harvested from the forests of New Hampshire during 1960 amounted to 195,000 cords. Plant residues probably supplied another 30,000 cords. About 40 percent of the pulpwood produced was from hardwood trees. Twelve years previously hardwoods made up 20 percent of the pulpwood.

The use of chips for wood pulp has boomed tremendously in the last 8 to 10 years. Most of this raw material has been mill

<sup>2</sup> Unpublished report, New Hampshire Agricultural Experiment Station.

Figure 2. — Use of wood chips for wood pulp has increased greatly. Converted mainly from sawmill slabs and edgings, large quantities are delivered to the mill in truck trailers.

PHOTO BY COURTESY OF THE BROWN CO., BERLIN, N. H.



waste—mainly from sawmills (fig. 2). Most of the veneer mill cores were also used for pulpwood. The previous timber-resource report showed that chipped residues made up less than 1 percent of the total pulpwood consumed in 1952. In only 7 years, the volume of chipped residues used jumped to 10 percent of the total.

Another recent trend in the pulp and paper industry in New Hampshire is to purchase pulpwood by weight. This has had little or no effect on timber-utilization standards; possibly a slightly higher proportion of defective material is being marketed. When green wood is bought by weight, 4,600 pounds of softwood or 5,600 pounds of hardwood is considered equivalent to 1 cord.

Although hardwoods made up almost half of the volume of pulpwood used in 1960, hardwood pulpwood is now a glut on the market. At one mill, the delivered price per cord of hardwood pulpwood dropped to a low of about \$14 in 1962 as compared with \$21 in 1952.

## OTHER WOOD-USING INDUSTRIES

Of the total output for all timber products about 15 percent (9,400,000 cubic feet) was produced by mills other than sawmills or pulpmills. Twenty-three registered mills in 1960 used about 3,000,000 cubic feet of wood—more than three-fourths of it hardwood—to produce turnery bolts, veneer (fig. 3), cooperage, box shooks, excelsior, handle stock, and miscellaneous specialty products. Fuelwood accounted for about 6,000,000 more cubic feet, mostly all hardwood. A relatively small amount of roundwood was used for piling, poles, and posts.

According to mills reporting their output to the State, about one-fifth of the turnery bolts, one-third of the cooperage logs and bolts, and more than one-half of the veneer logs and bolts were shipped out of the State.



PHOTO BY COURTESY OF THE BROWN CO., BERLIN, N. H.

Figure 3. — The timber resource of New Hampshire provides raw material for a number of other forest products besides lumber and wood pulp. These veneer logs are being moved from vats into a plywood mill.

## EMPLOYMENT AND INCOME

Employment in the nonagricultural industries in New Hampshire hit its last low point in 1949 when 169,000 workers were employed (N.H. Dept. of Employment Security 1962). Since then employment has increased rather steadily to 208,000 in 1961, with slight dips during recessions in 1954 and 1958. However, the trend was different for the industries that produce lumber and wood products, furniture and fixtures, and paper and allied products. In 1949 these industries employed 15,000 workers. The number increased to 17,000 workers in 1953, fluctuated in the intervening years, and in 1961 dropped to 14,000 workers.

About 10,000 additional jobs developed in New Hampshire during the last 3 years, the biggest increase in the electrical-products industry. During the same time, employment in the lumber and wood-products industry decreased by 600. And in the paper and allied-products industry employment decreased by 600 workers, too. Twelve years ago, the primary wood-using industries accounted for 9 percent of the nonagricultural industries employment; by 1961 their employment had dropped to 7 percent.

The payroll in 1959 for the 86,000 workers employed in all manufacturing industries in New Hampshire was \$312 million. Workers (15,400) in the primary wood-using industries received \$63 million, or 20 percent of that total. Payrolls in 1961 for all manufacturing industries increased to \$328 million, but corresponding payrolls for lumber and wood products, furniture and fixtures, and paper and allied products industries dropped to \$59 million—18 percent of the total for all industries.



# The Timber Resource

The nearly 5 million acres of commercial forest land in New Hampshire support almost 5 billion cubic feet of sound wood in live trees. Not all of this is considered to have commercial value. More than one-eighth of the total volume (669,000,000 cubic feet) is in trees of noncommercial species and in trees too rough, too crooked, or too rotten to be merchantable. The other seven-eighths of the sound wood volume make up the timber inventory upon which forest industries depend.

The timber supply for industrial use amounts to 4,315,000,000 cubic feet. This is referred to as *growing stock*<sup>3</sup>. The growing-stock volume is about equally divided between sawtimber trees and poletimber trees, a little more than 2 billion cubic feet in each class, and about equally divided between softwoods and hardwoods.

## GROWING STOCK

Growing-stock volume is the sound wood portion of all living trees, to a minimum 4-inch top, including sawtimber-size trees. Over all forest land in New Hampshire, there is an average volume of 880 cubic feet of growing stock per acre. The average volume per acre for sawtimber stands is 1,500 cubic feet; for poletimber stands it is 700 cubic feet; and for other areas it is 100 cubic feet.

White pine makes up 36 percent of the board-foot volume in sawtimber trees. But in terms of growing stock, it makes up only 24 percent. This means that the future board-foot volume of white pine will decrease in relation to total board feet of all species. The board-foot/cubic-foot ratio for other softwood species will remain about the same, and the corresponding ratio for hardwoods will increase.

Cubic-foot volume can be converted to a cordwood equivalent by using the ratio of 80 cubic feet of wood to 1 cord of wood with bark. For example, the 2.4 billion cubic feet of softwoods is equivalent to 30.0 million cords. The average volume per acre

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<sup>3</sup> See Appendix for definitions of this term and other terms used in this report.

of growing stock expressed in cords is 11 cords per acre—6.1 cords of softwoods and 4.9 cords of hardwoods.

Not quite all the cubic-foot volume shown for growing stock is suitable for pulpwood. Pulpwood volume specifications exclude bolts too crooked to meet specifications; they also exclude bolts that contain rot. Pulpwood volume also includes usable portions of trees that are classed as sound culls, but not as growing stock. These two factors are somewhat compensating. The total volume suitable for pulpwood amounts to 29.9 million cords of softwoods and 23.6 million cords of hardwoods.

## SAWTIMBER VOLUME

In 1960 (the timber-inventory year), the estimated volume of standing sawtimber trees was 8.6 billion board feet, an average of 1,750 board feet per forest acre. More important to those interested in timber production is the volume of sawtimber trees in sawtimber stands. The volume in sawtimber stands totals 6.6 billion board feet, or an average volume of 3,800 board feet per acre. Most of the remaining board-foot volume is in sawtimber trees that are scattered among poletimber and other stands.

About one-fifth of the board-foot volume in sawtimber trees is found on the White Mountain National Forest. The average board-foot volume per acre on National Forest land is almost twice that on commercial forest land outside the National Forest—3,000 board feet per acre as compared to 1,600 board feet.

White pine (and a small amount of red pine) makes up more than one-third of the board-foot volume—3.1 billion board feet. Other softwood species make up about another third (2.6 billion board feet), and hardwoods make up the remaining third (2.9 billion board feet). Most of the sawtimber volume is found in the smaller diameter classes, less than 15.0 inches d.b.h. Two-thirds of the white pine volume and 80 percent of all other softwood volume are in the smaller diameter classes. About 57 percent of the hardwood sawtimber volume is also in the smaller-size trees.

# Changes from Previous Survey

From the differences between the data for the two surveys, it is difficult to discern the real changes that have taken place in the forests of New Hampshire. Some of the differences are attributable to sampling accuracy; some of the differences are due to actual changes. Some differences can be explained in relation to other pertinent information such as timber cut and timber growth. Although all differences between the two sets of statistics are not necessarily due to actual changes, they will be given for the major breakdowns of forest-area and timber-volume classes.

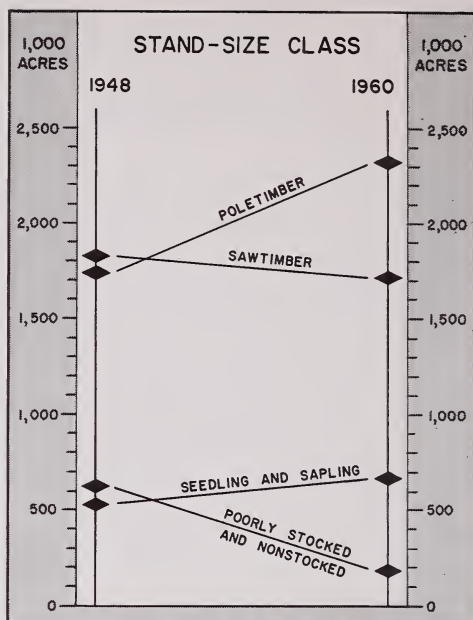
## FOREST AREA

The total commercial forest area in the State increased by 225,000 acres in the 12-year period between the two surveys. This increase is due mostly to abandonment of farmland; much of the open pasture and previously cultivated land that became idle is reverting back to forest. Without exception, commercial forest land increased in every county, and now no county in the State has less than 80 percent of its land area in forests, as the following tabulation shows:

<i>County</i>	<i>Land area (acres)</i>	<i>Commercial forest-land area</i>	
		<i>(acres)</i>	<i>(percent)</i>
Belknap	256,000	218,000	85
Carroll	600,300	537,800	90
Cheshire	458,900	394,500	86
Coos	1,166,100	1,002,400	86
Grafton	1,098,200	916,200	83
Hillsborough	569,600	475,100	83
Merrimack	594,600	519,000	87
Rockingham	442,200	352,300	80
Strafford	241,300	200,700	83
Sullivan	343,700	291,400	85
Total	5,770,900	4,907,400	85

The area of sawtimber stands remained about the same. The acreage of poletimber stands that grew into the sawtimber stand

Figure 4. — The changes in acreage of stand-size classes between 1948 and 1960. Poletimber stands increased by more than a third.



class compensated for the acreage that moved out of this class because of timber cutting (fig. 4).

The estimated forest area in poorly stocked stands and nonstocked area is considerably less now than it was in 1948. This estimation illustrates a change that is due mostly to the small number of sample plots used in these classes in both surveys, and their larger sampling errors. The actual area of such stands is probably much larger than the data show. Timber on some of this area increased sufficiently in size and volume to pass into the poletimber-stand classifications. Some of the poletimber and sawtimber stands that were cut reverted back into the poorly stocked and nonstocked classification. Probably thousands of acres of abandoned farmland changed from nonforest to seedling-and-sapling stands and poorly stocked stands. The net effect of these changes in the area of the two combined classes should result in about the same acreage (1,100,000 acres), but in 1960 the combined area was only 850,000 acres. The area that could be planted (poorly stocked stands and nonstocked areas) now exceeds 200,000 acres.

The resurvey shows a considerably different distribution of acreages in the major forest types, except for the white pine forest cover type (fig. 5). The maple-beech-yellow birch forest cover type has decreased in area. This is partially substantiated by a decrease in the inventory volume of yellow birch and sugar maple, but the decrease is probably not so great as shown. The area of the spruce-fir cover type shows a sharp increase. This too is probably due in part to a large sampling error as well as to a real difference. Some increase is substantiated by an increase in the volume of spruce and fir. No effort was made to show any change of area on the forest-type map (see page 45) that was made in 1947.

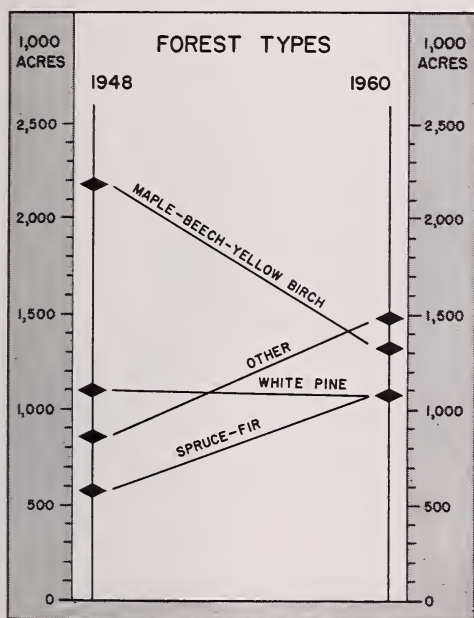


Figure 5. — The changes in distribution of forest types between 1949 and 1960. Considerable changes occurred, except for the white pine type.

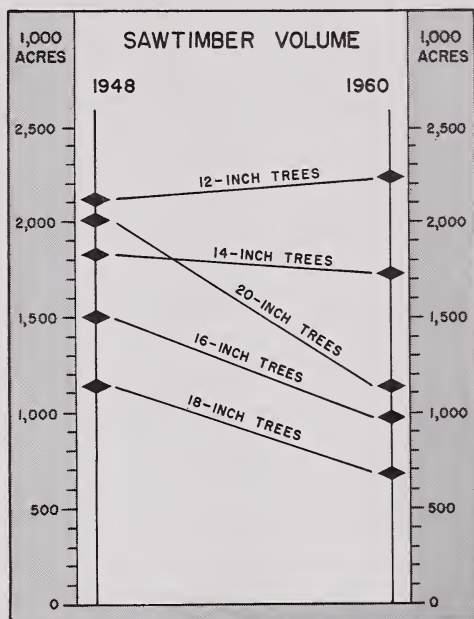
The average growing-stock volume per acre for all commercial forest land in New Hampshire increased by 60 cubic feet in 12 years to an average of 880 cubic feet per acre. During the same period, the average sawtimber volume per acre decreased by 325 board feet to an average of 1,750 board feet per acre.



## DISTRIBUTION OF TIMBER VOLUME

In 1948, slightly more than one-half of the board-foot volume (5.1 billion board feet) was in sawtimber trees of less than 15.0 inches d.b.h. By 1960, two-thirds of the board-foot volume was in this size group. The volume of trees in the 14-inch d.b.h. class changed only slightly during the 12-year period (fig. 6). Volumes in the larger diameter classes decreased, with the sharpest decrease in the 20-inch d.b.h. and larger tree class. The sharpest increase was for softwoods that make up the 10-inch d.h.h. class (not shown in figure); the volume for this class increased from 1.2 billion to 1.8 billion board feet.

Figure 6. — The changes in sawtimber volume between 1948 and 1960. Volumes in the larger diameter classes decreased.



## ERRATA

In Figure 6 on page 12, showing changes in sawtimber volume the units of measure should be million board feet rather than 1,000 acres.

## SPECIES COMPOSITION

White and red pine sawtimber volume decreased slightly, from 3.2 billion to 3.1 billion board feet (fig. 7). The estimated volume of hemlock decreased more sharply, from 1.2 billion board feet to less than 1 billion board feet, reflecting increased demand for this species. Spruce and fir now make up a correspondingly larger percentage of sawtimber volume. All together there was an apparent decrease of about 250 million board feet of softwood sawtimber in 1960.

Sugar maple and yellow birch made up slightly more than half the sawtimber volume of hardwood species in 1948. These two

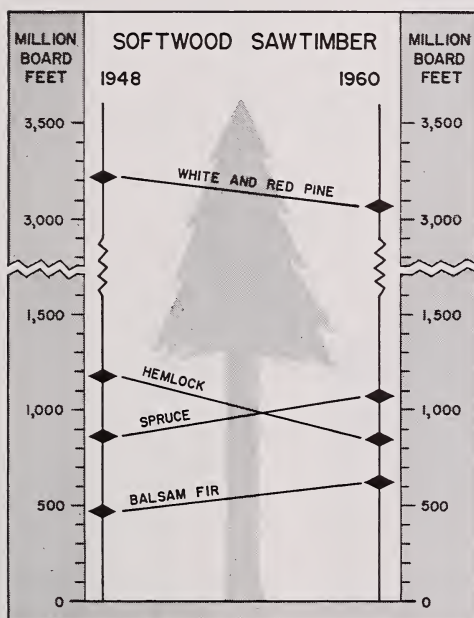


Figure 7. — The changes in softwood sawtimber volume between 1948 and 1960. Spruce and fir gained in volume.

species show a sharp decrease in volume—from 2.0 billion to 1.3 billion board feet (fig. 8). Increased cutting and mortality of the larger and better quality yellow birch trees—and sampling errors—can account for much of the decrease. For example, the estimated volume of yellow birch cut was about 15 million board feet in 1948. In 1959 two to three times as much volume of yellow

Figure 8. — The changes in hardwood sawtimber volume between 1948 and 1960. The decrease in yellow birch is due partly to increased cutting of the larger and better trees.

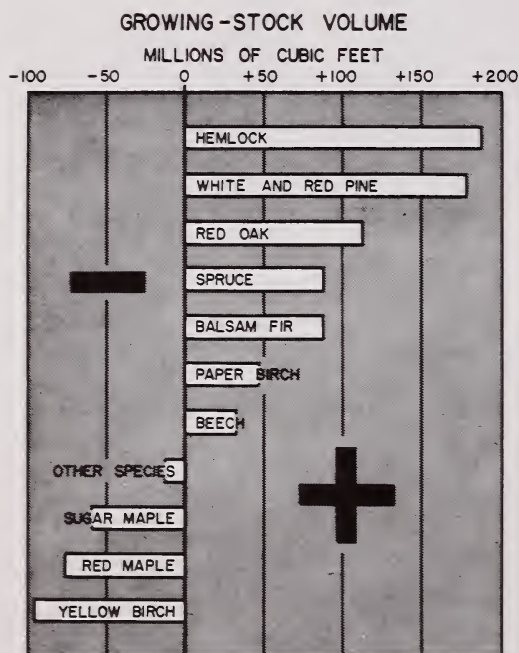
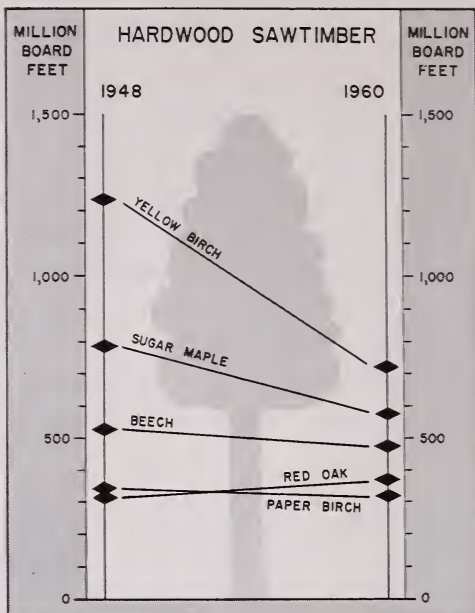


Figure 9.—The changes in growing-stock volume between 1948 and 1960, by species.



birch was being cut. Beech, paper birch, and red maple decreased somewhat in volume. Red oak and the other hardwood species showed an increase in board-foot volume.

Growing-stock volume changes among species were considerably different from the board-foot volume changes. Hemlock, white pine, paper birch, and beech showed decreases in board-foot volume, but increases in cubic-foot volume (fig. 9)—due mostly to the increase in poletimber volume.

## TIMBER QUALITY

Trees that make up a forest stand can be grouped into two broad classes: growing stock and other material. This other-material class includes trees of noncommercial species such as hophornbeam and pin cherry, trees that have too much rot, and trees that are sound but will not produce sawlogs that will meet grade specifications.<sup>4</sup> Trees that make up this class are generally referred to as rotten-cull and sound-cull trees. They made up 13 percent of the sound wood volume in all live trees in both 1948 and 1960.

The quality of sawtimber is not so good as it was. The larger trees, which contain the highest proportion of Grade 1 lumber logs, have been heavily cut. For example, there were 1.0 billion board feet in softwood trees 19.0 inches d.b.h. and larger in 1948, but by 1960 the volume in this class had dropped to 0.6 billion board feet. Yellow birch and sugar maple, which make up about half of the hardwood sawtimber volume, had 760 million board feet in trees larger than 19.0 inches d.b.h. in 1948, and this volume had dropped to 370 million board feet by 1960.

According to log-grade specifications, all softwood and most hardwood sawlogs must have a minimum small-end diameter of 13.0 inches to be considered for a Grade 1 log. Any tree that contains such a sawlog is almost without exception at least 15 inches d.b.h. The board-foot volume of trees 15.0 inches d.b.h. and larger (16-inch class) made up 48 percent of the total volume in 1948, but the volume of trees in this group decreased to 33 percent of the total by 1960 (fig. 6).

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<sup>4</sup> For log-grade specifications, see Appendix.

## OWNERSHIP

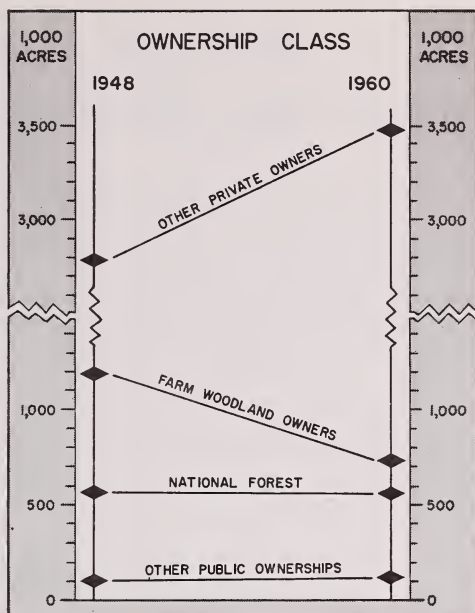
The largest single ownership in New Hampshire is the White Mountain National Forest, which administers 569,000 acres of commercial forest land. This land is almost 12 percent of the total in the State (fig. 10). Other Federally owned forest land amounts to 10,000 acres.



Figure 10. — The distribution of commercial forest land in New Hampshire in 1960, according to ownership.

Forest-industry holdings make up 16 percent of the commercial forest land (793,000 acres), mostly concentrated in nine ownerships of more than 25,000 acres each.

Figure 11.—The changes in distribution of forest area among ownership classes between 1948 and 1960.



Scattered throughout the State are 142 State forests and State parks that have a gross (both forest and nonforest) area of 64,000 acres. Other State-owned areas amount to 20,000 acres. About 66,000 acres of all State-owned land is commercial forest. County and municipally owned commercial forest land totals 52,000 acres.

Farm woodland, as reported by the Bureau of the Census (U. S. Bureau of Census 1959), amounts to 725,000 acres.

The bulk of the commercial forest land in New Hampshire (2.7 million acres) is owned by people who have holdings of less than 5,000 acres each. These are the businessmen, tradesmen, laborers, clerks, professional people, and summer residents—all together about 35,000 of them.

Changes in the forest-land-ownership pattern show a sharp drop of 315,000 acres in farm woodland since 1948 (fig. 11). Other private owners of commercial forest land increased their holdings by 514,000 acres. The acreages in National Forest and other public ownerships in 1960 remained about the same.

# Annual Growth of the Timber Supply

Net annual growth (see definition in the Appendix) is more easily understood through a description of its component parts. Components of the net annual growth are: (1) the increment in net volume (that is, after allowances for defect) of trees at the beginning of a specified year and surviving to its end (*survivor growth*), plus (2) the increment in net volume of trees at the beginning of the year that were cut or died during the year (*cut-tree or dead-tree growth*), plus (3) the net volume of trees that grew into growing stock (or sawtimber) during a specified year (*ingrowth*), minus (4) the net volume of trees that died from natural causes during the specified year (*mortality*), and minus (5) the net volume of trees that became cull trees during the year (*degrade*).

Estimates of net annual growth for previous forest-survey reports were based upon rates of growth that were determined from (1) increment cores extracted from sample trees and (2) the tally of merchantable, cull, and dead trees on the sample plots. The estimates in this report are based upon remeasured sample plots that were established 10 to 11 years previously. These remeasurements, we believe, give us better estimates for ingrowth and mortality as well as net annual growth.

Net annual growth of sawtimber is 252,000,000 board feet, an average of 51 board feet per acre per year, for all commercial forest land. Sawtimber stands (considered separately) would average more than 100 board feet of annual growth per acre.

Growing stock on the average acre of commercial forest land in New Hampshire is growing at the rate of 31 cubic feet a year. But mortality claims 7 cubic feet each year, which leaves a net annual growth of 24 cubic feet. The average net annual growth for sawtimber and poletimber areas combined would amount to about 30 cubic feet per acre, a little less than  $\frac{1}{2}$  cord per acre per year.

Board-foot growth estimates for 1952 were evidently much too high. Growth rates from increment cores resulted in an estimate



of 101 board feet per acre per year for all commercial forest land, almost double the present estimate. The breakdown of net annual growth into softwoods and hardwoods shows considerable differences between the proportions. In 1952, softwoods were estimated to make up 55 percent of the total board-foot growth, but in 1959 softwoods made up 73 percent of the total.

The previous report showed a substantial excess of timber growth over timber cut in both sawtimber and growing-stock volume. However, in 1960 the board-foot volume of sawtimber that was cut was approximately in balance with the net annual board-foot growth. The decline of white pine sawtimber volume cut has brought about an approximate balance between softwood board-foot net annual growth and the annual cut. Obviously a balance is not an end in itself but an indication of the present status as compared to a predetermined goal. The citizens of New Hampshire, and of the Nation, set the goals.

## **An Opportunity**

New Hampshire is one of the most extensively forested states in the country—87 percent of its land area supports some kind of forest cover. Most of the wood volume is in timber stands that are relatively young. As a result, total volume is increasing faster than timber is being cut.

By 1960, lumber production in New Hampshire had dropped to 175 million board feet. However, by 1975 production could rise to 350 million board feet if New Hampshire continues to produce its share of lumber and other products.

If production of timber in New Hampshire is to be increased, both the challenge and the opportunity for expansion of the forest industries are great. One approach to these opportunities is given in a recent research study, conducted under the direction of the New Hampshire State Planning and Development Commission (Stoddard and House 1961). This study offers suggestions for expansion and improvement of the forest-resource industries and for improving the production of timber on small ownerships.

Future trends in New Hampshire's production of timber products will be heavily influenced by competition with other softwood-producing areas, especially the West Coast. Industrial changes in the direction of larger mills and better equipment might be helpful in meeting this competition. Some changes are occurring; several large and well-equipped mills have been installed during the past 10 years.

However, industrial changes are occurring slowly. Aggregate data show that average production per sawmill has *not* increased during the period 1946-60 despite a 40-percent drop in the number of mills.<sup>5</sup> Will this transformation of the New Hampshire lumber industry go forward more rapidly? The answer will come from sawmill owners and operators and their technical and business advisors.


The decision to take up the challenge and to capitalize on the opportunity lies with the State of New Hampshire and its citizens.



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<sup>5</sup> Massie, Michael R.C. THE PRICE OF WHITE PINE STUMPAGE AND LUMBER DURING THE MOVEMENT OF NEW HAMPSHIRE SAWMILLS INTO AND OUT OF PRODUCTION. Unpublished Master's thesis, N. H. Univ. Dept. Forestry, 51 pp., 1962.

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# Appendix

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## DEFINITIONS OF TERMS

### *Forest Area*

*Forest land area.*—This includes: (a) lands that are at least 10 percent stocked with trees of any size and are capable of producing timber or other wood products, or of exerting an influence on the climate or on the water regime; (b) land from which the trees described in (a) have been removed to less than 10-percent stocking and that has not been developed for other use; and (c) afforested areas. (Forest tracts of less than 1 acre, isolated strips of timber less than 120 feet wide, and abandoned fields and pastures not yet 10-percent stocked with trees are excluded).

*Commercial forest land area.*—Forest land that is (a) producing, or physically capable of producing, usable crops of wood (usually sawtimber); (b) economically available now or prospectively; and (c) not withdrawn from timber utilization through statute, ordinance, or administrative order.

*Noncommercial forest land area.*—Forest land that is (a) withdrawn from timber utilization through statute, ordinance, or administrative order, but that otherwise qualifies as commercial forest land; or (b) incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

### *Forest Cover Types*

The forest cover types are classified according to the predominant species or species group, as indicated by cubic volume for sawtimber and poletimber stands, and number of trees for seedling-and-sapling stands. All local forest cover types in New Hampshire are keyed to the following four major types:

*White pine-red pine.*—Forests in which 50 percent or more of the stand is eastern white pine or red pine, singly or in combination. In New Hampshire it includes the white pine and hemlock types. A negligible acreage of the pitch pine type is also included.

*Spruce-fir.*—Forests in which 50 percent or more of the stand is spruce and fir. In New Hampshire it includes the spruce-fir, spruce-fir-hardwood, and cedar-tamarack-spruce types.

*Maple-beech-birch.*—Forests in which 50 percent or more of the stand is sugar maple, beech, or yellow birch, singly or in combination. In New Hampshire it includes the sugar maple-beech-yellow birch, hardwood-spruce-fir, and hardwood-white pine types. A small acreage of the oak and the ash-elm-maple types is also included.

*Aspen-birch.*—Forests in which 50 percent or more of the stand is aspen, paper birch, or gray birch, singly or in combination. In New Hampshire it includes the aspen, gray birch-pin cherry, and paper birch types.

## Class of Timber

*Sawtimber trees.*—Trees of commercial species that: (a) are of the following minimum diameters at breast height—softwoods 9.0 inches and hardwoods 11.0 inches; (b) contain at least one merchantable sawlog; and (c) contain at least 50 percent sound volume in the sawlog portion of the tree. (A merchantable sawlog is a portion of a live tree that meets the minimum log-grade specifications, as defined under log-grade classification. The sawlog portion is that part of the tree between the stump and the top of the last merchantable sawlog.)

*Poletimber trees.*—Trees of commercial species that meet regional specifications of soundness and form, and are of the following diameters at breast height; softwoods 5.0 to 9.0 inches; hardwoods 5.0 to 11.0 inches. Such trees will usually become sawtimber trees if left to grow.

*Seedling-and-sapling trees.*—Trees of commercial species less than 5.0 inches in diameter at breast height and of good form and vigor.

*Cull trees.*—Live trees of sawtimber or poletimber size that are unmerchantable for sawlogs now or prospectively because of defect or rot, or because they are of undesirable species.

*Pulpwood trees.*—Live trees of commercial species, 5.0 inches d.b.h. and larger, including sawtimber, poletimber, and even cull trees that contain at least two contiguous pulpwood bolts and of which 50 percent or more of the main-stem volume is usable for pulpwood.

## Stand-Size Classes

*Sawtimber stands.*—Stands with sawtimber trees having a minimum net volume per acre of 1,500 board feet, International  $\frac{1}{4}$ -inch rule.

*Poletimber stands.*—Stands that fail to meet the sawtimber-stand specification, but that are at least 10 percent stocked with poletimber and larger trees (5.0 inches d.b.h. and larger), and have at least one-half the minimum stocking in poletimber trees. Poletimber stands carry at least 200 cubic feet per acre.

*Seedling-and-sapling stands.*—Stands that do not qualify as either sawtimber or poletimber stands, but have at least 10 percent stocking of trees of commercial species, and have at least one-half the minimum stocking in seedling-and-sapling trees.

*Nonstocked areas.*—Areas that do not qualify as sawtimber, poletimber, or seedling-and-sapling stands; areas less than 10 percent stocked with trees of commercial species.

## Timber Volume

*Growing stock.*—Net volume, in cubic feet, of live sawtimber trees and live poletimber trees from stump to a minimum 4-inch top (of central stem) inside bark. Net volume = gross volume less deduction for rot.

*Live sawtimber volume.*—Net volume in board feet, International  $\frac{1}{4}$ -inch rule, of merchantable sawlogs in live sawtimber trees of commercial species. Net volume = gross volume in terms of the International  $\frac{1}{4}$ -inch rule less deduction for rot, sweep, and other defects that affect use for lumber.

*Pulpwood volume.*—Net volume in standard cords (including bark) of all trees that meet pulpwood tree specifications, regardless of whether

## WHITE PINE AND RED PINE LOGS

<i>Grade</i>	<i>D.i.b. small end (inches)</i>	<i>Length w/o trim (feet)</i>	<i>Total* deduction permitted</i>	<i>Surface requirements</i>
1	13+	8+	None	Surface clear 100%.
	13-16	12-16	25%	Must be $\frac{2}{3}$ surface clear in lengths 8' long or longer; or 50% surface clear full length.
	17+	10-16	30%	Must be $\frac{1}{2}$ surface clear in lengths 8' long or longer; or 25% surface clear full length.
2	All knots for Grade 2 logs must be sound and tight.			
	9-16	10+	30%	Knots not over 2.5" in diameter. Larger knots permitted only if 50% full length surface with knots not larger than 2.0" in diameter.
	17+	8+	40%	Knots not over 3.0" in diameter. Larger knots permitted only if 50% full length surface with knots not larger than 2.5" in diameter.
3	6-7	8+	25%	Sound knots not over 1" in diameter; or live knots not over 2.0" in diameter.
	8-13	8+	30%	No surface requirements, except logs with knots 4" or more in diameter in whorls less than 2' apart will not be accepted unless 25% or more full length surface with sound knots not over 2" in diameter.
	14+	8+	40%	No surface requirements, except that knots over 6" in diameter cannot be closer than 3' apart.

\* Total deduction includes sweep, rot, and other cull.

Figure 12. — The timber-grading specifications used in the forest survey of New Hampshire for white and red pine lumber logs.

or not these trees also meet sawtimber specifications. It includes the main stem from the stump to the point where the top breaks up into branches, or to a minimum top diameter of 4.0 inches (inside bark). Deductions are made for all portions of the stem that fail to meet pulpwood bolt requirements. The standard cord is a unit of measure for stacked wood, encompassing 128 cubic feet of wood, bark, and air space. Cord estimates are derived from cubic-foot measurements by applying a factor of 80 cubic feet of wood (inside bark) per rough cord.

## HARDWOOD FACTORY LOGS

Grade Factors*		Specifications							
		Log grade 1			Log grade 2			Log grade 3	
Position in tree		Butts only	Butts & uppers		Butts & uppers			Butts & uppers	
Minimum diameter (inches)		<sup>1</sup> 13-15	16-19	20+	<sup>2</sup> 11	12+		8+	
Minimum length (feet)		10+	10+	10+	10+	8-9	10-11	12+	8+
Clear** cuttings on each of the 3 best faces	Min. length (feet)	7	5	3	3	3	3	3	2
	Max. number	2	2	2	2	2	2	3	—
	Min. yield, face length	5/6	5/6	5/6	2/3	3/4	2/3	2/3	1/2
Max. sweep and crook allowance; % of gr. vol.		15			30			50	
Max. cull and sweep allowance; % of gr. vol.		<sup>3</sup> 40			<sup>4</sup> 50			50	

\*End defects, although not visible in standing trees, are important in grading cut logs. Instructions for dealing with this factor are contained in U.S. Forest Prod. Lab. Rpt. D1737.

\*\*A clear cutting is a portion of a face free of defects, extending the width of the face. A face is one-fourth the surface of the log as divided lengthwise.

<sup>1</sup> Ash and Basswood butts can be 12 inches if otherwise meeting the requirements for small No. 1's.

<sup>2</sup> 10-inch logs of all species can be No. 2 if otherwise meeting the requirements for small No. 1's.

<sup>3</sup> Otherwise No. 1 logs with 51-60 percent cull can be No. 2.

<sup>4</sup> Otherwise No. 2 logs with 51-60 percent cull can be No. 3.

Figure 13.—Hardwood timber-grading specifications for factory lumber logs, based on U.S. Forest Products Laboratory studies.

## *Product Specifications*

The product specifications used in the forest survey for hardwood lumber logs, hardwood tie and timber logs, and white pine lumber logs are shown in figures 12, 13, and 14. Product specifications for pulpwood bolts are given below:

*Pulpwood bolt.*—A pulpwood bolt is a 4-foot section of the main stem of any commercial species tree 5.0 inches d.b.h. and larger; 4.0 inches or larger inside bark at the small end; free from any indication of rot, charred

### HARDWOOD TIE AND LUMBER LOGS

Grade Factors		Specifications
Position in tree		Butts and uppers
Scaling diameter (inches)		8+
Length, without trim (feet)		8+
Clear cuttings		No requirements. Not graded on cutting basis.
Max. sweep allowance		One-fourth d.i.b. of small end for half logs, and one-half d.i.b. for logs 16 feet long.
Sound surface defects permitted	Single knots	Any number, if none has an average collar* diameter that is more than one-third of log diameter at point of occurrence.
	Whorled knots	Any number, provided the sum of the collar diameters does not exceed one-third the log diameter at point of occurrence.
	Holes	Any number not exceeding knot specifications if they do not extend more than 3 inches into the contained tie or timber.
Unsound** surface defects permitted	Any number and size if they do not extend into contained tie or timber. If they extend into contained tie or timber, they shall not exceed size, number, and depth of limits for sound defects.	

\*Knot collar is the average of the vertical and horizontal diameters of the limb or knot swelling as measured flush with the surface of the log.

\*\*Interior defects are not visible in standing trees. They are considered in grading cut logs. No interior defects are permitted except one shake not more than one-third the width of the contained tie or timber, and one split not more than 5 inches long.

Figure 14. — Timber - grading specifications used for hardwood construction timber.



wood, or hollow center; and contiguous to one or more other bolts that meet the same requirements. Crotches are excluded; sweep or crook in any section shall exclude the bolt if a line from the center of the top end to the center of the bottom end passes outside the wood at any point.

### *Annual Growth and Cut*

*Net annual growth of sawtimber.*—The change (resulting from natural causes) in net board-foot volume of live sawtimber on commercial forest land during a specified year.

*Ingrowth of sawtimber.*—The net board-foot volume of trees that first became sawtimber trees during the inventory year, as measured at the end of the year.

*Annual mortality of sawtimber.*—The net board-foot volume removed yearly from live sawtimber on commercial forest land through death from natural causes.

*Net annual growth of growing stock.*—The yearly change (resulting from natural causes) in net cubic-foot volume of growing stock on commercial forest land.

*Ingrowth of growing stock.*—The total net cubic-foot volume of trees that first become a part of growing stock during the inventory year, as measured at the end of the year.

*Annual mortality of growing stock.*—The net cubic-foot volume removed from growing stock during a year through death from natural causes.

*Annual cut of live sawtimber.*—The net board-foot volume of live sawtimber trees cut or killed by logging, land-clearing, or cultural operations on commercial forest land during a year.

*Annual cut of growing stock.*—The net cubic-foot volume of live sawtimber and poletimber trees cut or killed by logging, land-clearing, or cultural operations on commercial forest land during a year.

## FOREST-SURVEY METHODS

Our estimates of forest area, timber volume, and annual growth are based upon information obtained from two sets of data. The first set of estimates was from aerial photographs taken before 1948 and from sample plots examined on the ground. Photo plots were pin-pointed on aerial photographs and distributed uniformly over the entire State. Each photo plot was classified as either forest or nonforest, and each forest plot was classified further according to volume-per-acre classes.

Field crews then inspected many of the photo plots on the ground. Enough plots were selected at random to attain specified levels of sampling accuracy. Species, volume, and growth data were gathered on these ground plots. This set of data provided the statistics for the report *The Forest Resources of New Hampshire*, published in 1954.

More than 100 of those ground plots were revisited in 1956 and 1959. Plot centers were relocated, and a new tally of trees was made. The two tallies for each plot were reconciled with one another. This provided the means of obtaining the first part of the estimate of current timber volume and of obtaining a more reliable estimate of timber growth and mortality. Regression equations calculated from the remeasured plots were used to bring up to date the initial estimates of timber volume.

The second part of the estimate of forest area and timber volume was determined from aerial photographs taken between 1952 and 1955. Photo plots were put on these photographs, and each plot was classified as forest or nonforest. Forest plots were classified further according to cubic-foot volume classes. More than 450 new plots were selected at random within each cubic-foot volume class to attain specified levels of sampling accuracy.

The current estimates of forest area and timber volume used in this report were obtained by combining the first and second parts of the new estimates, weighted by their variance reciprocals.

Net annual timber growth was computed solely from the remeasured plots. New plot volume minus old plot volume of uncut plots equals gross growth for the number of years between measurements. Partially cut plots were also used with adjustments for growth on trees until they were cut. Data were summarized by species or species group and were converted from periodic growth to net annual growth.

Estimates of timber cut in New Hampshire were based upon production surveys made in cooperation with the New Hampshire Forestry and Recreation Commission, and wood-utilization studies made by the Northeastern Forest Experiment Station. The production surveys provided estimates of the output of all timber products. From studies conducted on various logging operations, estimates of logging residues were developed, which, when added to the volume of timber products, gave estimates of timber cut.

Sampling errors of breakdowns of commercial forest area in New Hampshire can be approximated from the relationship shown in the graph below (fig. 15). The steps are:

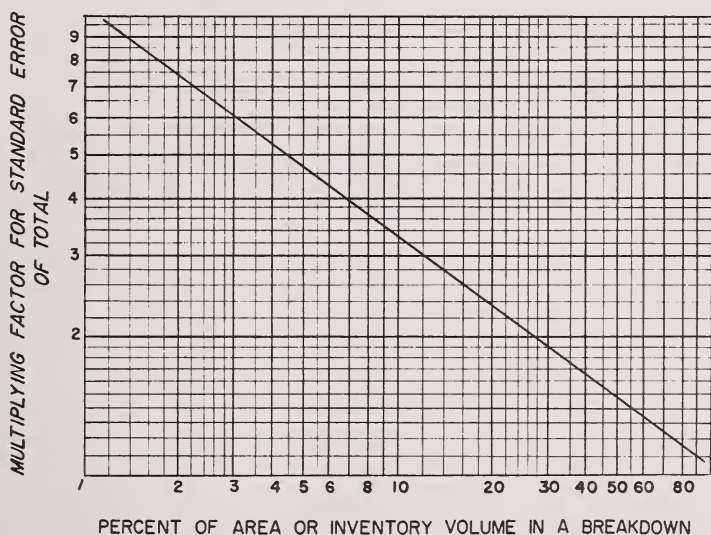


Figure 15. — The ratio of standard error of an area or volume breakdown to standard error of an area or volume total.

1. Compute the percentage that the breakdown contributes to the total (for example, the area of sawtimber stands is 36 percent of the total commercial forest area:  $1,746,600 \div 4,907,400 = 0.3558$ ).

2. Read from the graph the corresponding factor (for above example it would be about 1.8).

3. Multiply the sampling error of the total by the factor. This product is the approximate sampling error of the breakdown (for above example, the area of sawtimber stands would have a sampling error of about 3 percent:  $1.6 \times 1.8 = 2.88$ ).

Sampling errors of breakdowns of timber volume also can be approximated by use of the same graph.

## RELIABILITY OF THE ESTIMATES

The forest-area and timber-volume data presented in this report are based on a carefully designed sample of forest conditions throughout New Hampshire. However, since not every tree in the State was measured, the figures in this report are only estimates. A measure of the reliability of these estimates is given by the statistical sampling error. Each estimate in this report has a sampling error that could be computed, although only a few were computed.

Briefly, here is the way the sampling error indicates reliability. Our report of the total commercial forest area in New Hampshire, 4,907,000 acres, has an associated sampling error of 1.6 percent (79,000 acres). This means that our best estimate of the commercial forest area in New Hampshire in 1960 is 4,907,000 acres. And if there are no errors in procedure, the odds are 2 to 1 that, if we repeated the 1960 resurvey, the new estimate of commercial forest area would be between 4,986,000 and 4,828,000 acres ( $4,907,000 \pm 79,000$ ). Similarly, the odds are 19 to 1 that it would be within  $2 \times 79,000$  acres of the present estimate, and 300 to 1 that it would be within 227,000 acres of the present estimate.

The computed sampling error is not a complete measure of reliability; there are other sources of error that this term does not include. There could be imperfections in the volume tables used, and there could be errors in field measurement. However, the best volume tables available were used, and procedural errors were kept to a minimum by careful training of all personnel, frequent inspection of field work, and application of the most reliable survey methods.

Computed sampling errors for the totals shown in this report are as follows:

	<i>Sampling error (percent)</i>
Commercial forest area (4,907,400 acres)	1.6
Growing-stock volume (4,314,600,000 cubic feet)	3.4
Sawtimber volume (8,588,400,000 board feet)	5.3
Net annual growth (118,000,000 cubic feet)	6.6
Annual timber cut (66,000,000 cubic feet)	7.0

All breakdowns of commercial forest area in New Hampshire that are under 25,000 acres have approximate sampling errors greater than 25 percent. Similarly, all breakdowns of inventory volume that are less than 430,000,000 board feet or 220,000,000 cubic feet have approximate sampling errors greater than 25 percent.



## SPECIES TALLIED

Only the tree species<sup>6</sup> found on forest survey sample plots in New Hampshire are listed below. Other species that are found in New Hampshire are not included.

### Softwoods

Eastern white pine	<i>Pinus strobus</i>
Red pine	<i>Pinus resinosa</i>
Red spruce	<i>Picea rubens</i>
White spruce	<i>Picea glauca</i>
Black spruce	<i>Picea mariana</i>
Eastern hemlock	<i>Tsuga canadensis</i>
Balsam fir	<i>Abies balsamea</i>
Other eastern softwoods:	
Pitch pine	<i>Pinus rigida</i>
Tamarack	<i>Larix laricina</i>
Northern white-cedar	<i>Thuja occidentalis</i>
Atlantic white-cedar	<i>Chamaecyparis thyoides</i>
Eastern redcedar	<i>Juniperus virginiana</i>

### Hardwoods

Yellow birch	<i>Betula alleghaniensis</i>
Sugar maple	<i>Acer saccharum</i>
American beech	<i>Fagus grandifolia</i>
Northern red oak	<i>Quercus rubra</i>
Red maple	<i>Acer rubrum</i>
Paper birch	<i>Betula papyrifera</i>
Elm	<i>Ulmus</i> spp.
Ash	<i>Fraxinus</i> spp.
Aspen	<i>Populus</i> spp.
Other eastern hardwoods:	
White oak	<i>Quercus alba</i>
American basswood	<i>Tilia americana</i>
Hickory	<i>Carya</i> spp.
Butternut	<i>Juglans cinerea</i>
Black willow	<i>Salix nigra</i>
Sweet birch	<i>Betula lenta</i>
Black cherry	<i>Prunus serotina</i>

## NATIONAL STANDARD TABLES

To facilitate compilation of Forest Survey data for any group of States, region, or the Nation as a whole, a standard set of tables is presented in the timber resource report for each State. These tables are presented in the same sequence as those in other timber resource reports, but they do not necessarily have the same table number. The tables contain informa-

<sup>6</sup> Little, Elbert L. Jr. CHECK LIST OF NATIVE AND NATURALIZED TREES OF THE UNITED STATES (INCLUDING ALASKA). U.S. Dept. Agr. Handb. 41, 472 pp., 1953.

tion on forest area, ownership, timber volume, timber growth, and timber cut. The following tables present this information for the State of New Hampshire:

Table 1. — *Area by land classes, New Hampshire, 1960*

Land class	Area	
	<i>Acres</i>	<i>Percent</i>
Commercial forest land	4,907,400	85
Unproductive forest land	88,400	2
Productive-reserved forest land	23,500	(1)
Total forest land	5,019,300	87
Nonforest land <sup>2</sup>	749,700	13
All land <sup>3</sup>	5,769,000	100

<sup>1</sup> Less than 1 percent.

<sup>2</sup> Includes 33,000 acres of water according to Survey standards of area classification but defined by Bureau of the Census as land.

<sup>3</sup> From U.S. Bureau of the Census, Land and Water Area of the United States, 1960.

Table 2. — *Area of commercial forest land, by ownership classes, New Hampshire, 1960*

Ownership class	Area	
	<i>Acres</i>	<i>Percent</i>
National Forest <sup>1</sup>	569,000	12
Other Federal	9,600	(2)
State	65,700	1
County and municipal	52,300	1
Forest industry	793,000	16
Farmer-owned <sup>3</sup>	724,800	15
Miscellaneous private	2,693,000	55
All ownerships	4,907,400	100

<sup>1</sup> Includes both operable (217,000 acres) and inoperable (352,000 acres) areas.

<sup>2</sup> Less than 1 percent.

<sup>3</sup> Census of Agriculture, 1959.

Table 3. — *Area of commercial forest land, in acres, by stand-size and ownership classes, New Hampshire, 1960*

Stand-size class	All ownerships	National forest	Other public	Forest industry	Farmer and misc. private
Sawtimber stands	1,746,600	342,000	44,600	268,500	1,091,500
Poletimber stands	2,316,200	131,000	59,800	397,700	1,727,700
Seedling-and- sapling stands	677,500	96,000	17,900	93,500	470,100
Nonstocked areas	167,100	( <sup>1</sup> )	5,300	33,300	128,500
All classes	4,907,400	569,000	127,600	793,000	3,417,800

<sup>1</sup> Negligible.

Table 4.—*Area of commercial forest land, in acres, by stand-volume classes for sawtimber and other stand-size classes, New Hampshire, 1960*

Stand volumes per acre <sup>1</sup>	All stands	Sawtimber stands	Other stands
Less than 1,500 board feet	3,160,800	—	3,160,800
1,500 to 5,000 board feet	1,397,000	1,397,000	—
More than 5,000 board feet	349,600	349,600	—
All classes	4,907,400	1,746,600	3,160,800

<sup>1</sup> Net volume, International 1/4-inch rule.

Table 5. — *Area of commercial forest land, in acres, by forest types and ownership classes, New Hampshire, 1960*

Type	All ownerships	Public ownerships	Private ownerships
White-red-jack pine:			
White pine-hardwood	466,400	8,600	457,800
White pine	594,700	—	594,700
Hemlock	324,700	—	324,700
Total	1,385,800	8,600	1,377,200
Spruce-fir:			
Spruce-fir	416,200	112,600	303,600
Spruce-fir-hardwood	639,200	242,400	396,800
Total	1,055,400	355,000	700,400
Oak-hickory:			
Oak-white pine	308,100	—	308,100
White oak	87,800	—	87,800
Red oak	207,100	—	207,100
Total	603,000	—	603,000
Maple-beech-birch:			
Northern hardwood-white pine	178,600	—	178,600
Sugar maple-beech-yellow birch	963,100	297,500	665,600
Hardwood-spruce-fir	159,700	—	159,700
Total	1,301,400	297,500	1,003,900
Aspen-birch:			
Aspen	76,500	—	76,500
Gray birch-pin cherry	128,700	—	128,700
Paper birch	153,000	35,500	117,500
Red maple	84,800	—	84,800
Total	443,000	35,500	407,500
Ash-elm-maple	118,800	—	118,800
All types	4,907,400	696,600	4,210,800

Table 6. — *Area of noncommercial forest land, in acres, by forest types, New Hampshire, 1960*

Type	All areas	Productive reserved areas	Unproductive areas
Spruce-fir	72,400	—	72,400
Spruce-fir-hardwood	39,500	23,500	16,000
All types	111,900	23,500	88,400

Table 7. — *Number of growing-stock trees on commercial forest land, by diameter classes and by softwoods and hardwoods, New Hampshire, 1960*

(In thousands of trees)

D.b.h. class (inches)	All species	Softwoods	Hardwoods
1.0-2.9	2,197,900	783,300	1,414,600
3.0-4.9	890,000	463,900	426,100
5.0-6.9	341,500	165,400	176,100
7.0-8.9	192,900	100,700	92,200
9.0-10.9	81,900	45,700	36,200
11.0-12.9	36,200	21,100	15,100
13.0-14.9	19,600	11,100	8,500
15.0-16.9	8,100	4,400	3,700
17.0-18.9	3,900	2,300	1,600
19.0-28.9	4,200	2,500	1,700
29.0-38.9	100	—	100
All classes	3,776,300	1,600,400	2,175,900

Table 8. — *Volume of timber on commercial forest land, by class of timber and by softwoods and hardwoods, New Hampshire, 1960*

(In thousands of cubic feet)

Class of timber	All species	Softwoods	Hardwoods
Sawtimber trees:			
Sawlog portion	1,843,800	1,291,300	552,500
Upper-stem portion	260,700	152,800	107,900
Total	2,104,500	1,444,100	660,400
Poletimber trees	2,210,100	955,100	1,255,000
All growing-stock trees	4,314,600	2,399,200	1,915,400
Sound cull trees:			
Sawtimber-size trees	272,600	235,000	37,600
Poletimber-size trees	139,500	61,600	77,900
Total	412,100	296,600	115,500
Rotten cull trees:			
Sawtimber-size trees	186,000	14,000	172,000
Poletimber-size trees	70,500	8,300	62,200
Total	256,500	22,300	234,200
Total, all timber	4,983,200	2,718,100	2,265,100



Table 9. — *Volume of growing stock and sawtimber on commercial forest land, by ownership classes and by softwoods and hardwoods, New Hampshire, 1960*

Ownership class	All species	Softwoods	Hardwoods
GROWING STOCK (Thousand cubic feet)			
National Forest	801,900	274,900	527,000
Other public	108,200	66,900	41,300
Forest industry	665,700	403,400	262,300
Farmer and misc. private	2,738,800	1,654,000	1,084,800
All ownerships	4,314,600	2,399,200	1,915,400
SAWTIMBER (Thousand board feet) <sup>1</sup>			
National Forest	1,689,600	618,400	1,071,200
Other public	217,300	160,300	57,000
Forest industry	1,315,300	961,800	353,500
Farmer and misc. private	5,366,200	3,918,100	1,448,100
All ownerships	8,588,400	5,658,600	2,929,800

<sup>1</sup> International 1/4-inch rule.

Table 10. — *Volume of growing stock and sawtimber on commercial forest land, by stand-size classes and by softwoods and hardwoods, New Hampshire, 1960*

Stand-size class	All species	Softwoods	Hardwoods
GROWING STOCK (Thousand cubic feet)			
Sawtimber stands	2,569,100	1,543,900	1,025,200
Poletimber stands	1,657,800	825,000	832,800
Seedling-and-sapling stands	73,200	25,900	47,300
Nonstocked areas	14,500	4,400	10,100
Total	4,314,600	2,399,200	1,915,400
SAWTIMBER (Thousand board feet) <sup>1</sup>			
Sawtimber stands	6,598,400	4,271,400	2,327,000
Poletimber stands	1,936,600	1,370,800	565,800
Seedling-and-sapling-stands	53,400	16,400	37,000
Nonstocked areas	(2)	(2)	(2)
Total	8,588,400	5,658,600	2,929,800

<sup>1</sup> International 1/4-inch rule.

<sup>2</sup> Negligible.

Table 11. — *Volume of growing stock on commercial forest land, by species and diameter classes, New Hampshire, 1960*

(In thousands of cubic feet)

Species	All classes	Diameter class (inches at breast height)										15.0-16.9	17.0-18.9	19.0-28.9	29.0-38.9
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-28.9	29.0-38.9					
Softwoods:															
White and red pine	1,049,300	96,300	146,300	214,200	168,200	185,000	74,700	55,100	109,500	—	—	—	—	—	—
Spruce	443,900	87,800	108,700	125,800	74,400	28,000	10,000	3,900	5,300	—	—	—	—	—	—
Balsam fir	512,800	172,400	205,000	80,600	36,100	8,700	9,300	200	500	—	—	—	—	—	—
Hemlock	380,600	43,800	86,800	70,200	56,400	38,700	37,700	25,100	21,900	—	—	—	—	—	—
Others	12,600	1,000	6,900	(1)	4,700	—	—	—	—	—	—	—	—	—	—
Total	2,399,200	401,300	553,700	490,800	339,800	260,400	131,700	84,300	137,200	—	—	—	—	—	—
Hardwoods:															
Northern red oak	270,300	62,900	87,600	47,000	24,200	25,200	10,800	5,100	7,500	—	—	—	—	—	—
Yellow birch	314,100	43,100	58,200	60,000	34,600	32,900	19,800	17,700	44,500	3,300	—	—	—	—	—
Sugar maple	240,000	53,400	35,300	25,100	29,800	33,700	10,600	22,300	27,900	1,900	—	—	—	—	—
Red maple	254,600	83,500	72,600	37,000	28,800	20,200	9,400	1,700	1,400	—	—	—	—	—	—
Beech	244,100	35,500	64,200	47,100	44,600	11,700	16,500	9,800	14,700	—	—	—	—	—	—
Paper birch	347,100	75,700	118,000	85,100	42,600	17,100	8,600	—	—	—	—	—	—	—	—
Others	245,200	70,200	63,800	30,900	27,000	21,200	22,800	5,600	3,700	—	—	—	—	—	—
Total	1,915,400	424,300	499,700	332,200	231,600	162,000	98,500	62,200	99,700	5,200	—	—	—	—	—
All species	4,314,600	825,600	1,053,400	823,000	571,400	422,400	230,200	146,500	236,900	5,200	—	—	—	—	—
<sup>1</sup> Negligible.															

<sup>1</sup> Negligible.

Table 12. — *Volume of sawtimber on commercial forest land by species and diameter classes, New Hampshire, 1960*

(In thousands of board feet)<sup>1</sup>

Species	Diameter class (inches at breast height)							
	All classes	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 28.9	29.0- 38.9
<b>Softwoods:</b>								
White and red pine	3,071,900	721,200	601,800	699,500	304,800	247,000	497,600	—
Spruce	1,085,800	530,600	328,100	127,800	50,200	20,100	29,000	—
Balsam fir	600,600	335,400	171,800	35,500	53,800	1,300	2,800	—
Hemlock	885,400	221,900	208,200	114,400	145,200	103,800	91,900	—
Others	14,900	(2)	14,900	—	—	—	—	—
Total	5,658,600	1,809,100	1,324,800	977,200	554,000	372,200	621,300	—
<b>Hardwoods:</b>								
Northern red oak	366,900	—	106,600	136,900	53,100	27,300	43,000	—
Yellow birch	724,500	—	134,400	190,500	87,200	80,400	217,700	14,300
Sugar maple	566,300	—	113,600	156,300	44,000	115,900	126,800	9,700
Red maple	246,900	—	103,100	92,100	37,700	7,600	6,400	—
Beech	477,100	—	184,900	55,900	82,600	61,300	92,400	—
Paper birch	318,700	—	164,100	87,800	44,700	18,300	3,800	—
Others	229,400	—	102,700	31,900	81,000	4,600	9,200	—
Total	2,929,800	—	909,400	751,400	430,300	315,400	499,300	24,000
All species	8,588,400	1,809,100	2,234,200	1,728,600	984,300	687,600	1,120,600	24,000

<sup>1</sup> International 1/4-inch rule.

<sup>2</sup> Negligible.

Table 13. — *Net annual growth and annual cut of growing stock on commercial forest land, by species, New Hampshire, 1959*  
(In thousands of cubic feet)

Species	Net annual growth	Annual timber cut
Softwoods:		
White and red pine	31,100	27,600
Spruce and fir	28,400	5,100
Other eastern softwoods	11,600	9,700
Total	<sup>1</sup> 71,100	42,400
Hardwoods:		
Northern red oak	6,600	2,600
Yellow birch	7,600	10,000
Sugar maple	5,800	5,100
Other eastern hardwoods	26,500	6,000
Total	<sup>2</sup> 46,500	23,700
All species	117,600	66,100

<sup>1</sup> Net annual growth was calculated for all softwood trees combined. This total was prorated to above softwood species.

<sup>2</sup> Net annual growth was calculated for all hardwood trees combined. This total was prorated to above hardwood species.

Table 14. — *Net annual growth and annual cut of growing stock on commercial forest land, by ownership classes and by softwoods and hardwoods, New Hampshire, 1959*

Species groups	All ownerships	National Forest	Other public	Forest industry	Farmer and misc. private
NET ANNUAL GROWTH (thousand cubic feet)					
Softwoods <sup>1</sup>	71,100	8,200	2,000	11,900	49,000
Hardwoods <sup>2</sup>	46,500	12,800	1,000	6,400	26,300
All species	117,600	21,000	3,000	18,300	75,300
ANNUAL TIMBER CUT (thousand cubic feet)					
Softwoods	42,400	500	100	2,000	39,800
Hardwoods	23,700	1,200	100	5,000	17,400
All species	66,100	1,700	200	7,000	57,200

<sup>1</sup> Net annual growth for softwood trees was calculated for all ownerships combined. This total was prorated to above ownership classes.

<sup>2</sup> Net annual growth for hardwood trees was calculated for all ownerships combined. This total was prorated to above ownership classes.

Table 15.—*Net annual growth and annual cut of sawtimber on commercial forest land, by species, New Hampshire, 1959*  
(In thousands of board feet)<sup>1</sup>

Species	Net annual growth	Annual timber cut
Softwoods:		
White and red pine	99,900	118,000
Spruce and fir	54,900	25,500
Other eastern softwoods	29,300	21,400
Total	<sup>2</sup> 184,100	164,900
Hardwoods:		
Northern red oak	8,500	11,300
Yellow birch	16,800	38,400
Sugar maple	13,100	17,500
Other eastern hardwoods	29,500	21,600
Total	<sup>3</sup> 67,900	88,800
All species	252,000	253,700

<sup>1</sup>International 1/4-inch rule.

<sup>2</sup>Net annual growth was calculated for all softwood trees combined. This total was prorated to above softwood species.

<sup>3</sup>Net annual growth was calculated for all hardwood trees combined. This total was prorated to above hardwood species.

Table 16.—*Net annual growth and annual cut of sawtimber on commercial forest land, by ownership classes and by softwoods and hardwoods, New Hampshire, 1959*

Species groups	All ownerships	National Forest	Other public	Forest Industry	Farmer and misc. private
NET ANNUAL GROWTH (thousand board feet) <sup>1</sup>					
Softwoods <sup>2</sup>	184,100	20,100	5,200	31,300	127,500
Hardwoods <sup>3</sup>	67,900	24,800	1,300	8,200	33,600
All species	252,000	44,900	6,500	39,500	161,100
ANNUAL TIMBER CUT (thousand board feet) <sup>1</sup>					
Softwoods	164,900	2,900	—	22,000	140,000
Hardwoods	88,800	5,200	—	8,000	75,600
All species	253,700	8,100	—	30,000	215,600

<sup>1</sup>International 1/4-inch rule.

<sup>2</sup>Net annual growth for softwood trees was calculated for all ownerships combined. This total was prorated to above ownership classes.

<sup>3</sup>Net annual growth for hardwood trees was calculated for all ownerships combined. This total was prorated to above ownership classes.



Table 17. — *Annual mortality of growing stock and sawtimber on commercial forest land, by softwoods and hardwoods, New Hampshire, 1959*

Species group	Growing stock	Sawtimber
	<i>Thousand cubic feet</i>	<i>Thousand board feet</i> <sup>1</sup>
Softwoods	21,600	50,300
Hardwoods	14,100	18,600
All species	35,700	68,900

<sup>1</sup> International 1/4-inch rule.

Table 18. — *Total output of timber products, by products, by type of material used, and by softwoods and hardwoods, New Hampshire, 1959*

Product and species groups	Total output in standard units		Output from roundwood		Output from plant by-products (standard units)
	Unit	Number	Standard units	M cubic feet	
Sawlogs:					
Softwood	M bd. ft. <sup>1</sup>	167,900	167,900	31,700	—
Hardwood	M bd. ft. <sup>1</sup>	35,300	35,300	7,200	—
Total	M bd. ft. <sup>1</sup>	203,200	203,200	38,900	—
Veneer logs and bolts:					
Softwood	M bd. ft.	—	—	—	—
Hardwood	M bd. ft.	11,500	11,500	2,100	—
Total	M bd. ft.	11,500	11,500	2,100	—
Cooperage logs and bolts:					
Softwood	M bd. ft.	2,700	2,700	500	—
Hardwood	M bd. ft.	600	600	100	—
Total	M bd. ft.	3,300	3,300	600	—
Pulpwood:					
Softwood	Std. cords <sup>2</sup>	145,300	118,700	9,500	26,600
Hardwood	Std. cords <sup>2</sup>	111,900	111,700	8,900	200
Total	Std. cords <sup>2</sup>	257,200	230,400	18,400	26,800
Piling:					
Softwood	M linear ft.	—	—	—	—
Hardwood	M linear ft.	9	9	4	—
Total	M linear ft.	9	9	4	—

CONTINUED

Table 18. — Continued

Product and species groups	Total output in standard units		Output from roundwood		Output from plant by-products (standard units)
	Unit	Number	Standard units	M cubic feet	
Poles:					
Softwood	M pieces	4	4	99	—
Hardwood	M pieces	—	—	—	—
Total	M pieces	4	4	99	—
Misc. industrial <sup>3</sup> wood:					
Softwood	M cu. ft.	69	69	69	—
Hardwood	M cu. ft.	229	221	221	8
Total	M cu. ft.	298	290	290	8
Posts (round and split):					
Softwood	M pieces	14	14	11	—
Hardwood	M pieces	102	102	46	—
Total	M pieces	116	116	57	—
Fuelwood:					
Softwood	Std. cords	11,200	600	43	10,600
Hardwood	Std. cords	86,700	75,500	6,042	11,200
Total	Std. cords	97,900	76,100	6,085	21,800
All products:					
Softwood	M cu. ft.	44,900	42,000	42,000	2,900
Hardwood	M cu. ft.	25,600	24,700	24,700	900
Total	M cu. ft.	70,500	66,700	66,700	3,800

<sup>1</sup> International 1/4-inch rule.<sup>2</sup> Rough wood basis (for example, chips converted to equivalent standard cords).<sup>3</sup> Includes hewn ties, excelsior bolts, shingle bolts, turnery bolts, chemical wood, etc.

Table 19. — *Total output of roundwood products, by source and by softwoods and hardwoods, New Hampshire, 1959*

(In thousands of cubic feet)

Source	All species	Softwoods	Hardwoods
Growing-stock trees: <sup>1</sup>			
Sawtimber trees	47,841	34,592	13,249
Poletimber trees	12,676	5,289	7,387
Total	60,517	39,881	20,636
Cull trees <sup>1</sup>	1,221	600	621
Salvable dead trees <sup>1</sup>	603	136	467
Other sources <sup>2</sup>	4,307	1,356	2,951
All sources	66,648	41,973	24,675

<sup>1</sup> On commercial forest land.

<sup>2</sup> Includes noncommercial forest land, nonforest land such as fence rows, trees less than 5.0 inches in diameter, and treetops and limbs.

Table 20. — *Annual timber cut from growing stock on commercial forest land, by products and logging residues, and by softwoods, and hardwoods, New Hampshire, 1959*

(In thousands of cubic feet)

Products and residues	All species	Softwoods	Hardwoods
Roundwood products:			
Sawlogs	36,958	31,007	5,951
Veneer logs and bolts	2,095	—	2,095
Cooperage logs and bolts	628	507	121
Pulpwood	16,432	8,143	8,289
Piling	4	4	—
Poles	98	98	—
Misc. industrial wood	272	68	204
Posts	56	11	45
Fuelwood	3,974	43	3,931
All products	60,517	39,881	20,636
Logging residues	5,574	2,552	3,022
Timber cut	66,091	42,433	23,658

Table 21. — *Annual timber cut from live sawtimber on commercial forest land, by products and logging residues, and by softwoods and hardwoods, New Hampshire, 1959*

(In thousands of board feet)<sup>1</sup>

Products and residues	All species	Softwoods	Hardwoods
Roundwood products:			
Sawlogs	183,520	143,884	39,636
Veneer logs and bolts	11,028	—	11,028
Cooperage logs and bolts	2,959	2,352	607
Pulpwood	32,833	17,525	15,308
Piling	20	20	—
Poles	426	426	—
Misc. industrial wood	429	127	302
Posts	42	—	42
Fuelwood	8,965	—	8,965
All products	240,222	164,334	75,888
Logging residues	13,477	550	12,927
Timber cut	253,699	164,884	88,815

<sup>1</sup> International 1/4-inch rule.

Table 22. — *Volume of unused plant residues by industrial source<sup>1</sup> and by type of residue, and by softwoods and hardwoods, New Hampshire, 1959*

(In thousands of cubic feet)






Species group	Total	Coarse <sup>2</sup>	Fine <sup>3</sup>
Softwoods	5,045	1,145	3,900
Hardwoods	1,438	538	900
All species	6,483	1,683	4,800

<sup>1</sup> The lumber industry was the only source in New Hampshire.

<sup>2</sup> Unused material suitable for chipping, such as slabs, edgings, and veneer cores.

<sup>3</sup> Unused material not suitable for chipping, such as sawdust and shavings.

NEW HAMPSHIRE  
FOREST COVER TYPES

-  WHITE AND RED PINE
-  SPRUCE-FIR
-  MAPLE-BEECH-BIRCH
-  ASPEN-BIRCH
-  NONFOREST

0 25  
MILES

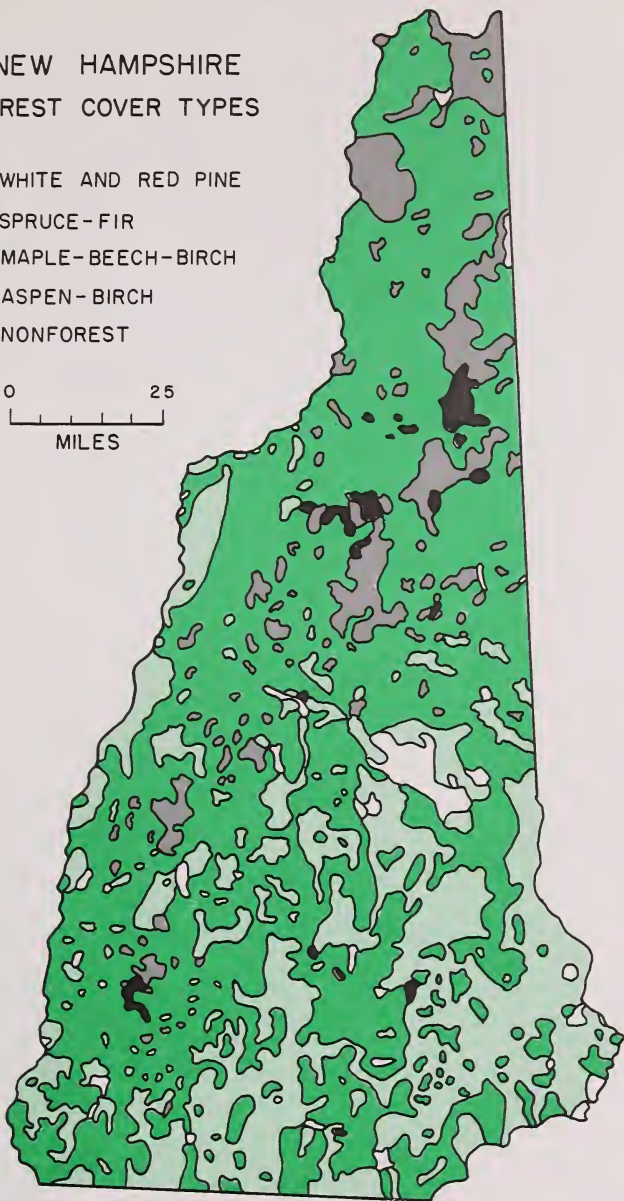


Figure 16.— The delineation of forest cover types in New Hampshire. The type boundaries are unchanged from those delineated in 1947.



## The Authors

ROLAND H. FERGUSON is a forest economist in the Northeastern Forest Experiment Station's Division of Forest Economic Research. He received his Bachelor of Science degree in forestry at Oregon State College in 1931, and joined the U. S. Forest Service in 1934. After serving in the southern pine and Douglas-fir regions, he came to the Northeast in 1945, since which time he has been engaged in various aspects of the forest survey.

VICTOR S. JENSEN had his professional training at the University of Minnesota and the Yale School of Forestry, and spent several years in administrative work with the U. S. Indian Service and the U. S. Forest Service in Oregon, Washington, Idaho and Utah. Except for 2 years as War Production lumber advisor for New Hampshire during World War II, he has served with the Northeastern Forest Experiment Station continuously since 1929, mainly in research in management of northern hardwoods. He is project leader for the Experiment Station's forest-management research project at Laconia, New Hampshire.

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